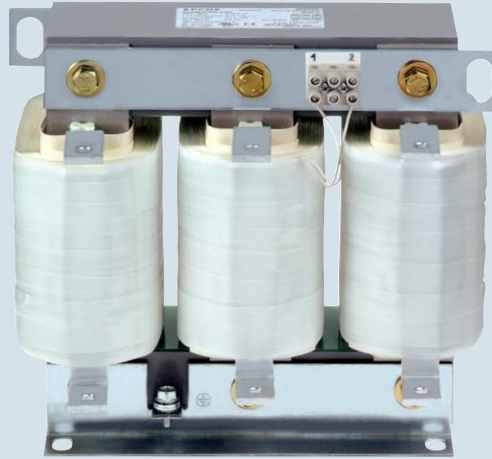


Antiresonance Harmonic Filter

Reactors

Features

- High harmonic loading capability
- Very low losses
- High linearity to avoid choke tilt
- Low noise
- Convenient mounting
- Long expected life time
- Temperature protection (NC contact)



General

Electrical energy is a significant production factor for industry, and its efficient use should be a primary objective. Reducing the reactive current component by PFC correction helps to save energy.

The increasing use of modern power electronic apparatus (drives, uninterruptible power supplies, etc) produces nonlinear current, influences and loads the network with harmonics (line pollution).

The power factor correction or capacitance of the power capacitor forms a resonant circuit in conjunction with the feeding transformer. Experience shows that the self-resonant frequency of this circuit is typically between 250 and 500 Hz, i.e. in the region of the 5th and 7th harmonics.

Resonance can lead to the following undesirable effects:

- overloading of capacitors,
- overloading of transformers and transmission equipment,
- interference with metering and control systems, computers and electrical gear,
- resonance elevation, i.e. amplification of harmonics,
- voltage distortion.

These resonance phenomena can be avoided by connecting capacitors in series with filter reactors. Detuned systems are scaled so that the self-resonant frequency is below the lowest line harmonic. The detuned PFC system is purely inductive seen by harmonics above this frequency. For the 50 Hz line frequency, the detuned system acts purely capacitively, thus correcting the reactive power.

Antiresonance Harmonic Filter

Reactors



Reactors

Technical data and limit values	
Filter reactors	
Harmonics*	$V_3 = 0.5\% V_R$ (duty cycle = 100%) $V_5 = 6.0\% V_R$ (duty cycle = 100%) $V_7 = 5.0\% V_R$ (duty cycle = 100%) $V_{11} = 3.5\% V_R$ (duty cycle = 100%) $V_{13} = 3.0\% V_R$ (duty cycle = 100%)
Effective current	$I_{rms} = \sqrt{I_1^2 + I_3^2 + \dots + I_{13}^2}$
Fundamental current	$I_1 = 1.06 \cdot I_R$ (50 Hz or 60 Hz current of capacitor)
Temperature protection	microswitch (NC)
Three-phase filter reactors to EN 61558 / VDE 0532 / EN 60289	
Frequency	50 Hz or 60 Hz
Voltage	400, 440, 480 V
Output	5 ... 100 kvar
Detuning	5.67%, 7%, 14%
Cooling	natural
Ambient temperature	40 °C
Class of protection	I
Enclosure	IP00
Approval	

* According to DIN ENV VV61000-2-2

Characteristics									
Power kvar	Δ capacitance $3 \cdot \mu\text{F}$	Inductance mH	I_{rms} (I_{eff}) A	Losses* W	Weight kg	Drawing number	Terminal	Ordering code	Packing unit
Rated voltage $V = 400$ V, $f = 50$ Hz, $p = 5.67\%$ ($f_r = 210$ Hz) / Linearity: $L \geq 0.95 \cdot L_R$ for current up to $2.08 \cdot I_1$									
10	62	3.06	18.5	64	6.4	1c	10 mm ² Kl.	B44066D5010S400	40
12.5	78	2.45	23.0	89	8.4	1d	10 mm ² Kl.	B44066D5012S400	40
20	125	1.53	36.9	100	13	1e	10 mm ² Kl.	B44066D5020S400	18
25	156	1.22	46.1	130	17	1f	10 mm ² Kl.	B44066D5025S400	18
40	250	0.765	73.7	220	23	3b	M6 Al-flat	B44066D5040S400	18
50	312	0.612	92.1	290	31	3c	M6 Al-flat	B44066D5050S400	12
75	496	0.408	138.2	280	35	3c	M8 Al-flat	B44066D5075S400	12
100	625	0.306	183.8	390	47	3d	M8 Al-flat	B44066D5100S400	1
Rated voltage $V = 400$ V, $f = 50$ Hz, $p = 7\%$ ($f_r = 189$ Hz) / Linearity: $L \geq 0.95 \cdot L_R$ for current up to $1.73 \cdot I_1$									
10	61	3.83	16.4	73	5.9	1c	10 mm ² Kl.	B44066D7010S400	40
12.5	77	3.07	20.5	87	8.1	1d	10 mm ² Kl.	B44066D7012S400	40
20	123	1.92	32.7	100	12	1e	10 mm ² Kl.	B44066D7020S400	40
25	154	1.53	41.0	120	16	1f	10 mm ² Kl.	B44066D7025S400	18
40	246	0.958	65.6	210	23	3b	M6 Al-flat	B44066D7040S400	18
50	308	0.766	81.9	210	24	3b	M6 Al-flat	B44066D7050S400	18
75	462	0.511	122.9	267	32	3c	M8 Al-flat	B44066D7075S400	12
100	617	0.383	164.2	370	46	3d	M8 Al-flat	B44066D7100S400	1

* Total max. losses, considering max. specified overvoltage and harmonic currents

Antiresonance Harmonic Filter

Reactors

Characteristics									
Power	Δ capacitance	Inductance	I_{rms} (I_{eff})	Losses*	Weight	Drawing number	Terminal	Ordering code	Packing unit
kvar	$3 \cdot \mu F$	mH	A	W	kg				
Rated voltage V = 400 V, f = 50 Hz, p = 14% (f_r = 135 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.4 · I₁									
10	57	8.23	15.4	87	9.4	1d	10 mm ² Kl.	B44066D1410S400	40
12.5	71	6.63	19.2	100	12	1e	10 mm ² Kl.	B44066D1412S400	18
20	114	4.14	30.8	120	18	1f	10 mm ² Kl.	B44066D1420S400	18
25	142	3.32	38.5	210	25	2a	10 mm ² Kl.	B44066D1425S400	18
40	228	2.07	61.6	220	32	3c	M6 Al-flat	B44066D1440S400	1
50	285	1.66	76.9	340	34	3c	M6 Al-flat	B44066D1450S400	1
75	427	1.1	115.4	330	52	3d	M8 Al-flat	B44066D1475S400	1
100	570	0.829	154	450	62	3e	M8 Al-flat	B44066D1499S400	1
Rated voltage V = 400 V, f = 60 Hz, p = 5.67% (f_r = 252 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 2.08 · I₁									
25	130	1.02	46.1	130	16	3a	M5 Al-flat	B44066D5025S401	18
50	260	0.51	92.2	230	26	3b	M6 Al-flat	B44066D5050S401	18
75	391	0.34	138.2	280	34	3c	M8 Al-flat	B44066D5075S401	12
100	521	0.255	184.3	370	48	3d	M8 Al-flat	B44066D5100S401	1
Rated voltage V = 400 V, f = 60 Hz, p = 7% (f_r = 227 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.73 · I₁									
25	128	1.29	41.0	103	16	3a	M5 Al-flat	B44066D7025S401	18
50	257	0.64	81.9	205	24	3b	M6 Al-flat	B44066D7050S401	18
75	385	0.426	122.9	245	33	3c	M8 Al-flat	B44066D7075S401	12
100	514	0.319	163.9	310	45	3d	M8 Al-flat	B44066D7100S401	1
Rated voltage V = 400 V, f = 60 Hz, p = 14% (f_r = 162 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.4 · I₁									
25	118	2.76	38.5	130	25	2a	10 mm ² Kl.	B44066D1425S401	18
50	237	1.38	77.0	250	34	3c	M6 Al-flat	B44066D1450S401	12
75	356	0.92	115.4	340	49	3d	M8 Al-flat	B44066D1475S401	1
100	475	0.69	154.0	400	55	3d	M8 Al-flat	B44066D1499S401	1
Rated voltage V = 440 V, f = 50 Hz, p = 5.67% (f_r = 210 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 2.08 · I₁									
10	51	3.7	16.8	74	7	1c	10 mm ² Kl.	B44066D5010S440	40
12.5	64	2.96	21.0	88	9	1d	10 mm ² Kl.	B44066D5012S440	40
25	129	1.48	42.0	130	16.5	3a	M5 Al-flat	B44066D5025S440	18
50	258	0.74	83.8	230	25	3b	M6 Al-flat	B44066D5050S440	18
75	387	0.49	125.6	260	36	3c	M8 Al-flat	B44066D5075S440	1
100	517	0.37	168.0	340	50	3d	M8 Al-flat	B44066D5100S440	1
Rated voltage V = 440 V, f = 50 Hz, p = 7% (f_r = 189 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.73 · I₁									
10	50	4.64	14.9	71	6.5	1c	4 mm ² Kl.	B44066D7010S440	40
12.5	63	3.71	18.7	85	8.5	1d	10 mm ² Kl.	B44066D7012S440	40
25	127	1.86	37.2	105	17	3a	M5 Al-flat	B44066D7025S440	18
50	254	0.93	74.5	210	25	3b	M6 Al-flat	B44066D7050S440	18
75	382	0.618	112.2	250	35	3c	M8 Al-flat	B44066D7075S440	12
100	509	0.464	148.9	370	47	3d	M8 Al-flat	B44066D7100S440	1

* Total max. losses, considering max. specified overvoltage and harmonic currents



Reactors

Antiresonance Harmonic Filter

Reactors

Characteristics									
Power	Δ capacitance	Inductance	I_{rms} (I_{eff})	Losses*	Weight	Drawing number	Terminal	Ordering code	Packing unit
kvar	$3 \cdot \mu F$	mH	A	W	kg				
Rated voltage V = 440 V, f = 50 Hz, p = 14% (f_r = 135 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.4 · I₁									
10	47	10	14.0	87	10	1d	4 mm ² Kl.	B44066D1410S440	40
12.5	58	8.03	17.5	95	13	1e	10 mm ² Kl.	B44066D1412S440	18
25	117	4	35.0	130	26	2a	10 mm ² Kl.	B44066D1425S440	18
50	235	2.12	70.0	260	40	3c	M6 Cu-flat	B44066D1450S440	1
75	353	1.34	105.0	350	52	3d	M8 Al-flat	B44066D1475S440	1
100	471	1	140.0	440	66	3d	M8 Cu-flat	B44066D1499S440	1
Rated voltage V = 440 V, f = 60 Hz, p = 5.67% (f_r = 252 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 2.08 · I₁									
25	107	1.235	42.0	125	18	3a	M5 Al-flat	B44066D5025S441	18
50	215	0.617	83.8	210	25	3b	M6 Al-flat	B44066D5050S441	18
75	323	0.412	126.0	300	33	3c	M8 Al-flat	B44066D5075S441	12
100	431	0.309	167.4	400	47	3d	M8 Al-flat	B44066D5100S441	1
Rated voltage V = 440 V, f = 60 Hz, p = 7% (f_r = 227 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.73 · I₁									
25	106	1.55	37.2	100	16	3a	M5 Al-flat	B44066D7025S441	18
50	212	0.773	74.5	190	24	3b	M6 Al-flat	B44066D7050S441	18
75	318	0.515	111.8	235	34	3c	M8 Al-flat	B44066D7075S441	12
100	424	0.387	148.9	350	46	3d	M8 Al-flat	B44066D7100S441	1
Rated voltage V = 440 V, f = 60 Hz, p = 14% (f_r = 162 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.4 · I₁									
25	98	3.34	35.0	100	24	2a	10 mm ² Kl.	B44066D1425S441	18
50	196	1.67	70.0	240	35	3c	M6 Al-flat	B44066D1450S441	12
75	294	1.11	105.0	360	48	3d	M8 Al-flat	B44066D1475S441	1
100	392	0.836	140.0	450	52	3d	M8 Al-flat	B44066D1499S441	1
Rated voltage V = 480 V, f = 60 Hz, p = 5.67% (f_r = 252 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 2.08 · I₁									
25	90	1.47	38.3	130	18	1f	10 mm ² Kl.	B44066D5025S481	18
50	181	0.74	76.8	300	31	3c	M8 Al-flat	B44066D5050S481	12
75	271	0.49	115.1	230	33	3c	M8 Al-flat	B44066D5075S481	12
100	362	0.367	153.6	400	47	3d	M8 Al-flat	B44066D5100S481	1
Rated voltage V = 480 V, f = 60 Hz, p = 7% (f_r = 227 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.73 · I₁									
12.5	44	3.68	17.0	71	6.5	1c	4 mm ² Kl.	B44066D7012S481	40
25	89	1.84	34.2	103	13.2	1e	10 mm ² Kl.	B44066D7025S481	18
50	178	0.92	68.4	240	24.2	3b	M6 Al-flat	B44066D7050S481	18
75	267	0.61	102.4	270	32	3c	M8 Al-flat	B44066D7075S481	12
100	357	0.46	136.7	270	35	3c	M8 Al-flat	B44066D7100S481	1
Rated voltage V = 480 V, f = 60 Hz, p = 14% (f_r = 162 Hz) / Linearity: L ≥ 0.95 · L_R for current up to 1.4 · I₁									
25	82	4.0	32.1	155	20	2a	10 mm ² Kl.	B44066D1425S481	18
50	165	2.0	64.1	280	34	3c	M6 Al-flat	B44066D1450S481	12
75	247	1.33	96.2	350	48	3d	M8 Al-flat	B44066D1475S481	1
100	330	1.0	128.2	430	53	3d	M8 Al-flat	B44066D1499S481	1

* Total max. losses, considering max. specified overvoltage and harmonic currents



Reactors

Antiresonance Harmonic Filter

Reactors

Cautions

During operation, all electrically active parts of this equipment such as windings, electronic components, leads, fuses and terminals carry a dangerous voltage which can lead to burns or electric shock.

Covers which protect these electrically active parts from being touched must not be opened or removed during operation.

Before any assembly or maintenance work is started, all installations and equipment must be disconnected from the power source.

Noncompliance with these instructions may lead to death, serious injury or major damage to equipment.

In order to exclude impermissible temperatures and thus overload of the insulation system, the following directions must additionally be observed:

1. Only those protective devices specified on the type plates, such as fuses and motor protection switches, may be used. It is mandatory to observe the set values specified for the motor protection switches. Any temperature-sensitive protective devices such as temperature switches and temperature sensors must be connected in accordance with the installation instructions.
2. High temperatures are permissible for the surfaces under rated oper-

ating conditions, and especially in the event of overload. Depending on the temperature class and type of loading, these may attain values of up to 260 °C and may also affect adjacent components which have been packed too densely.

3. The insertion position should be selected so that any cooling ducts present within the winding are arranged vertically and that the current of cooling air is not impeded by adjacent components, connecting leads etc.
4. The maximum voltage of the insulating system specified on the type plate must not be exceeded.

Noncompliance with these instructions may lead to considerable damage to equipment or fire due to impermissibly high temperatures.

Terminals

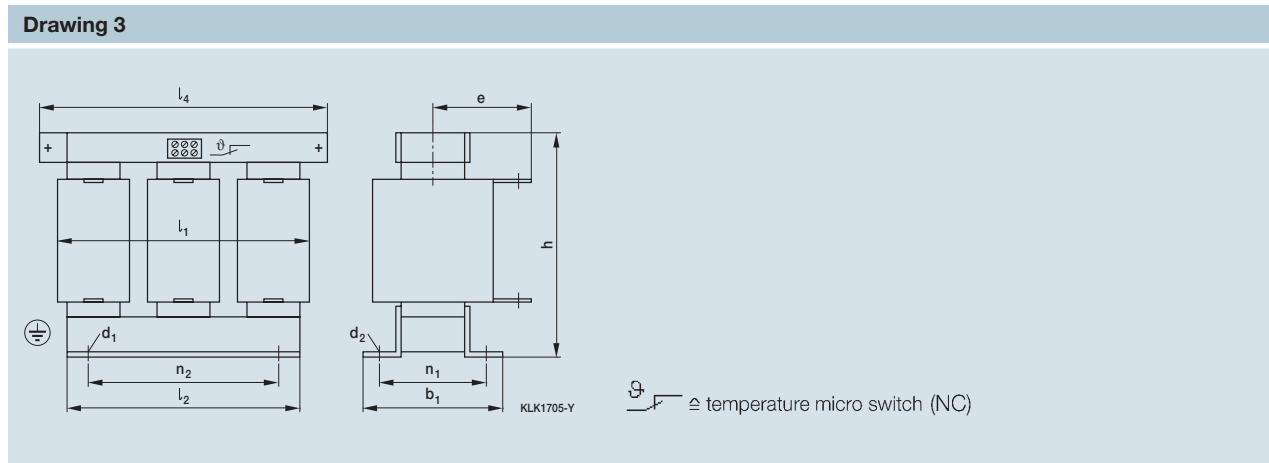
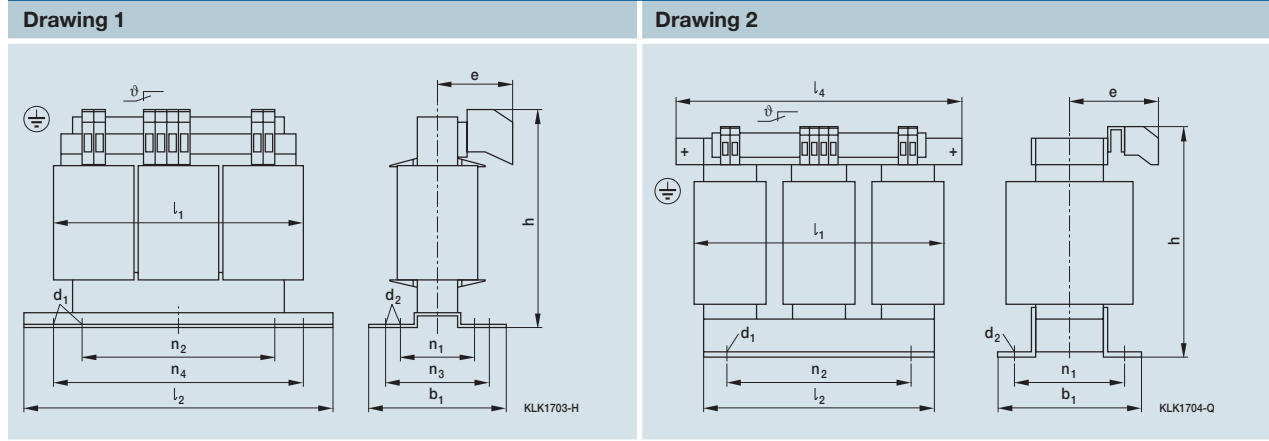
Connection type	Clamp size	Tightening torque	Stripping length	Screwdriver point
		Nm		
Screw clamp	4 mm ² cl.	0.5	11.0	0.8 x 4.0
	10 mm ² cl.	2.5	13.0	1.2 x 6.5
Flat terminal	M5 Al-flat	3.0	–	–
	M6 Cu-flat	6.0	–	–
	M6 Al-flat	6.0	–	–
	M8 Cu-flat	13.0	–	–
	M8 Al-flat	13.0	–	–

Antiresonance Harmonic Filter

Reactors



Dimensional drawings



Drawing 1¹⁾

	b1	d1	d2	d3	e max.	h max.	I1 max.	I2	n1	n2	n3	n4
a	73	5.8	11	M5	60	159	150	178	49	113	53	166
b	88	5.8	11	M5	67	159	150	178	64	113	68	166
c	99	7	13	M6	62	181	182	219	56	136	69	201
d	119	7	13	M6	72	181	182	219	76	136	89	201
e	107	7	13	M6	66	221	228	267	70	176	77	249
f	131	7	13	M6	79	221	228	267	94	176	101	249

Drawing 2²⁾

	b1	d1	d2	d3	e max.	h max.	I1 max.	I2	I4	n1	n2
a	162	10	18	M8	108	291	264	220	270	101	200

Drawing 3²⁾

	b1	d1	d2	d3	e max.	h max.	I1 max.	I2	I4	n1	n2
a	115	7	12	M6	103	210	228	190	–	94	176
b	133	10	18	M8	121	248	264	220	270	101	200
c	148	10	18	M8	137	269	300	250	300	118	224
d	169	10	18	M8	142	321	360	300	350	138	264
e	174	12	18	M10	171	385	405	350	410	141	316

¹⁾ Insulation class B: 130 °C, ²⁾ Insulation class H: 180 °C